**Study guide of your Final Exam (January 22, Tuesday, Periods 3&4, Room 715)**  
  
The exam will cover the materials after mid-term exam. You need to study:   
(1) Lecture notes (after mid-term exam): Parental care, Social behavior, Cognition,  
       Personality, and Evolution of human behavior.  
(2) Quiz (Quiz #3-5)  
(3) Reading assignments (the articles we discussed).  
(4) Two documentary films (Dog decoded; Ape genius): questions we   
         discussed in the class.   
  
Email me ([liuw@mail.rockefeller.edu](mailto:liuw@mail.rockefeller.edu)) if you have questions about the final exam.  
  
The final exam includes (1) multiple choice (2) short answer; (3) true or false; (4) short essay.   
  
Make sure you understand the main points of the articles we discussed:   
1. [Of voles and men: exploring the genetics of commitment](http://blogs.discovermagazine.com/notrocketscience/2008/09/02/of-voles-and-men-exploring-the-genetics-of-commitment/" \o "Permanent Link to Of voles and men: exploring the genetics of commitment). Vassopressin receptor 1a/mating system    
2. The pregnant brain as a revving race car-why moms evolve better spatial memory, more sensitive

# 3. Fatherhood leads to drop testosterone-why? 4. [Study of Alpha Male Baboons Shows It’s Stressful at the Top](http://newyorksparrow.wikispaces.com/file/view/Study+of+Alpha+Male+Baboons+Shows+It%E2%80%99s+Stressful+at+the+Top+-+NYTimes.pdf/387372564/Study%20of%20Alpha%20Male%20Baboons%20Shows%20It%E2%80%99s%20Stressful%20at%20the%20Top%20-%20NYTimes.pdf) , how about females social hierarchy.

# [How It's Hard and Healthy at the Top](http://newyorksparrow.wikispaces.com/file/view/Jonah+Lehrer+on+How+It%27s+Hard%E2%80%94and+Healthy%E2%80%94at+the+Top+_+Head+Case+-+WSJ.pdf/387372780/Jonah%20Lehrer%20on%20How%20It%27s%20Hard%E2%80%94and%20Healthy%E2%80%94at%20the%20Top%20_%20Head%20Case%20-%20WSJ.pdf). During fight, the subordinates produce more stress hormones

# Baboon Social Life Study Shows 'Nice' Animals Have Better Health, Longer Lives 5. Animal thinking: definition of animal consciousness by Don Griffin, examples. 6. Alex the parrot: why is unique about Alex’s cognition compared to chimps or dolphins? 7. Looking for personality in Animals: Examples and experiments to test animal personality. Why do

# animals evolve different personality? DRD4 genes are associated with animal personality. 8. Farm fox experiment. How to domesticate animals? Selective breeding of one behavioral trait

# can affect the development of other behavioral/morphological/physiological traits. Possible

# associated hormones? The major concepts that I have been emphasized during the class:

1. Animal behavior (including humans) is the product of evolution; animal behavior is evolutionarily adaptive through natural selection. Natural selection may operate through individual, gene, or group level. Know how to differentiate each.
2. Identify proximate and ultimate questions, and come up with testable hypotheses and design experiments to test the hypothesis (short essay)
3. Innate and learning behavior: even the most complex learned (human) behaviors are, to a certain degree, under the control of genetic program. On the other hand, simple innate behaviors often times can be modified by experience (learned).
4. Species-specific talents: Different animal species have different intelligence to adapt to their environment; some animals can detect magnetic field, some can produce or detect ultrasounds; bowerbirds can build extraordinary courtship arena to court females; and social insects are highly altruistic.
5. Genes and behavior: how do genes control behavior? How do genes interact with environment and indirectly control behavior?  Is there such thing as a monogamy gene or intelligent gene? NO, most behaviors likely result from multiple genes (even hundreds or thousands of genes).
6. Parental care: Sexual conflicts of parental care (under what circumstances is best adaptive for maternal care or paternal care: how it is related to internal/external fertilization)? Parent-offspring recognition is different between colonial and solitary species, examples (why)? Parent-offspring conflicts: infanticide: why do animals evolve infanticide (two hypotheses)? Or sibling rivalry: siblicide? why do parents allow siblicide to happen? Parental care has a big impact on the mental development (stress response) of young, and importantly, this behavior can be passed to the next generation through epigenetic program: environmental agents change the on or off of gene expression: methylation of DNA or modification of chromatin). Glucocorticoid receptor gene is correlated with stress response.
7. Social behavior: Identify different types of social interactions; Examples of game theory applied to social behavior (hawk/dove; tit for tat) and examples. Define inclusive fitness and kin selection (examples). Know how to calculate inclusive fitness. Define eusocial animals and examples. How did eusociality evolve? (two major mechanisms inbreeding/ haplodiploid, example for each)
8. Animal cognition: Why it is difficult to study animal cognition? The message of Clever Hans’s story. Empathy, its definition and examples in animals (rats, chimps, hippos), the discovery of mirror neurons helps us understand evolution of empathy. How to demonstrate self-awareness in animals and examples? Do animals have emotions? And why do animals evolve emotions or feelings (evolutionary adaptation)?
9. Animal cognition: Is language required for rational thought? Examples in animals? What animals can learn and recognize gesture language?
10. To better understand animal’s mind and intelligence, we need to understand the animal’s natural history. Example: The milk bottle opening by the blue tits: a similar skill has been regularly used in its daily behavior in nature, but accidentally applied to milk bottle and was rewarded. Examples of Animal “culture”?
11. Differences between chimps and humans: how evolutionary theory interprets such a big gap in between humans and chimps, given the great similarity in genomes.
12. Personality: Personality in invertebrates (octopus) and other species; Personality is partially determined by genes, including personality.  A shy person can become a leader when reared by more social parents. Why (evolutionary adaptation) do animals evolve different personality (novelty seeking/shy)? What is pleiotrophy trait?
13. Evolution of human culture and behavior:  According to evolutionary theory, we can identify the evolutionary roots in human behaviors, including highly diverse human culture.  Examples like mate choice (fits in what sexual selection models and examples), adoption (3 different mechanisms and example for each), blood donation (reciprocity or altruism or culture), and religions (innate predisposition for supernature), demonstrate how these behaviors or culture might be evolutionarily adaptive.